

**Automated EMS Vital Signs Collection and Communication System (AVEMS) Survey  
Methodology and Analysis**

An Interactive Qualifying Project submitted to the Faculty of Worcester Polytechnic  
Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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With our project goals in mind, trying to improve the levels of communication and efficiencies in the field of triage while keeping respect to the limited resources and equipment Triage programs have to spare. We set out to get a more grounded understanding of the current issues in EMT practice and discover and address the issues and inefficiencies, both technical and physical, triage workers face during mass casualty situations. Knowing that the best information comes from out in the field and the people dealing with these issues daily, we set out to research what difficulties or stressors triage workers were encountering throughout their daily practice in their work environments. This was in order to see what field experienced opinions were and to focus in on the major challenges that they encountered to best orient our future efforts.

In looking at past studies on related research into the inefficiencies and stress points triage workers need to maneuver through their day to day practice, we found a high incidence of workers having both psychological and physical burnout due to low worker morale along with structural challenges they encounter in daily tasks. And these factors lead to inefficiencies of the performance of triage units. A 2019 study by Mostafa Bijani and Ali Asghar Khaleghi looking into the barriers affecting efficient and accurate treatment in emergency rooms found that the burden of the effort to keep emergency rooms running smoothly rests on two factors. One being the expertise and moral of triage nursing staff and the second being administrative decision making in relation to the emergency wards management. While a 2018 study examines the accuracy of emergency departments by Jeremiah S. Hinson, Diego A. Martinez, Paulo S. K. Schmitz, Matthew Toerper, Daniel Radu, James Scheulen, Sarah A. Stewart de Ramirez, Scott Levin discovered that around one in five patients in an emergency ward were treated with the warranted level of care resulting in them being either over or under triaged. With each patient's need of care and route of treatment being decided by a standardized algorithmic Emergency Severity Index, and with approximately one fifth of patients not correctly processed by the algorithm it was found the the consequences are that under triaged patients were more likely to be admitted or experience a critical outcome while those over triaged were less likely to experience both outcomes. While in a comprehensive study Bonnie M. Jennings looked at studys put out over the past few decades examining the relationship

between emergency nurse burnout rate and patient wellbeing, quality of care and patient outcome Jennings found that the actual conclusive data on the matter was limited with only four studies focusing on the desired factors. Though the emerging pattern was a negative correlation between burnout rate and positive patient outcomes. Looking at these results we can see a possible connection between the data in a negative cycle. General administrative decisions towards methodology of treatment and injury severity lead to inaccurate levels of triage emerging. Over triaged patients then take the much needed limited time and resources of EMT practitioners leading to a higher rate of critical outcomes emerging in the under triaged patients. The negative outcomes of the undertriage patents then go on in general to negatively impact the morale of EMT practitioners, causing higher levels of inefficiencies in the treatment process of patients; perpetuating the negative cycle. This information allows us to better see where we can be effective in designing a system that helps address some of the present issues.

In order to better understand the possible inefficiencies that arise in the EMT process a questionnaire was constructed to look into the perspectives of EMT practitioners and how they view the administrative limitations and psychological environment they face on the job. The survey begins with a listing of demographic information to ascertain what aspect of triage the surveyor is a part of; EMT, nurse, doctor, or paramedic. Along with gathering their age, gender, medical background whether civilian or military, the survey goes on to question them regarding possible product features that were thought up based on the background research. These included various ways of increasing communication of patient information in cases of mass casualty situations like *the ability to chat or voice call with an on call physician while off site and collection and distribution of images and vital data of the patient to EMS before patient arrives along with composition and administrative filing of prehospital report before the patient arrives to EMS.* The questionnaire goes on to question them regarding their own individual experiences in the field, particularly issues we would be unaware of or not fully informed of. We ask them a range of questions. Starting with open-ended questions like *what is the most stressful aspect of their job, what is the most time consuming task/tasks they perform or are there any issues or inefficiencies based on the technology they currently use and to describe what those issues are.* Besides just looking at the more emotional aspects of how they

view their job, we also inquired into more of the object issues they run into, such as; *the means by which communication is moved throughout the hospital system and how effective it is and any benefits or complications to their work brought on by the current software and hardware that they used.* The questionnaire then had the surveyor rate on a 5 point scale each of the same proposed system features that we arrived at and initially asked about, based on the background research, and asked them to label their perpetual viability as a benefit to their field, along with their everyday practice.

Though we reached out to individuals over the course of almost 2 months for responses through a variety of medians, we were unable to garner any completed surveys. Many individuals practicing in the field who were contacted showed interest, enthusiasm and care for the project and subject matter at hand, however they all made it clear that due to limiting circumstances their ability to complete the survey or sit down for an interview was compromised. All of whom agreed to attempt the survey; sadly no surveys were returned. The method of data collection used was to begin with cold calling online listings of triage practitioners based on the Linkin database. From there, we moved on to cold calling local emergency medical service programs in order to further disperse the survey to in field practitioners. Lastly, after the preliminary wave of outreach didn't yield any results, we then included exploring personal contacts within the field as distribution points for the survey. As stated previously, no surveys were returned completed or even partially completed, which brings us to the limiting factors brought to our attention over the course of sending out this survey and speaking directly with triage staff. This field of work is grueling and requires phenomenal hours of time in training and expertise building but also in their day to day lives, taking its toll both physically and emotionally on the worker. A 2021 study performed by Oisín Sheehan , Micheal Sheehan , Raluca Ileana Rau , Iomhar O Sullivan , Geraldine McMahon , and Ann Payne looked to access the effect that the Covid-19 pandemic had on the wellbeing of emergency departments specifically looking at burnout. They found that while at the time the pandemic had no clear trajectory on where it would yet go, roughly seventy five percent of respondents reported experiencing some level of burnout causing an effect on their daily functioning. While a recent study from February 2022 by Perry M. Gee, Marla J. Weston, Tom Harshman, Lesly A. Kelly came to the

conclusion that the effect of the pandemic on the emergency triage field and the medical field as a whole goes far deeper than just severe burnout. Large amounts of dissatisfaction and an air of hopelessness or futility towards their work were reported along with approximately forty percent of the practicing triage nurses claiming they plan to leave the field entirely within the next two years. With their reasoning being the large second hand trauma they took on and the buildup of cumulative grief and moral distress. To the detriment of the industry, the current weight of the covid pandemic has vastly exacerbated the stressors all healthcare workers were already facing. The primary issues manifesting are understaffing as workers hit peak levels of burnout and leave, over working and those who remain are forced to pick up the slack with the increased patient load, lack of deeper satisfaction with the nature of the work as cumulative burnout and waves of the pandemic berate workers with a feeling of seeming futility and hopelessness, lack of proper structural and social support for those EMT workers on the frontlines and a general feeling of disconnection from the human element of the practice of medicine. This results in mass burn out within the industry and the emergence of a general feeling of dissatisfaction.

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